



Technology Evaluation for Environmental Risk Mitigation Principal Center

Portable Laser Coating Removal System

JG-PP Project Number: J-00-CR-017

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Project Summary

National Aeronautics and Space Administration (NASA) and Department of Defense (DoD) use coatings and paints on airframes, components, and ground support equipment (GSE) primarily for corrosion protection. Removal and reapplication of these coatings is necessary for reasons such as surface inspection or replacement of damaged or degraded coatings. Current methods for small area and supplemental removal of coatings have included the use of hazardous solvents, abrasive blast media, and hand sanding. These methods are costly, time consuming, labor-intensive, and result in undesirable environmental conditions including the release of Volatile Organic Compounds (VOCs), particulate matter emissions, and dusting.

This project was aimed at validating an innovative coating removal system using handheld portable laser technology. Low-power, lightweight, handheld portable laser systems were selected based on their performance during screening tests and on commercial-off-the-shelf availability. Three laser systems were chosen: carbon dioxide, neodymium: yttrium-aluminum-garnet (Nd:YAG), and diode. Testing requirements included demonstrating effectiveness of coating removal from typical aerospace materials without causing damage to the substrate.

The Nd:YAG portable laser system performed the best and had the best ease of use. The technology was validated as an effective and environmentally safe alternative to existing depainting processes and substrate materials were not significantly affected. As a result of this demonstration, hand held laser systems have been procured and are in the process of being implemented at all Air Force Air Logistics Centers and Army bases such as Fort Rucker. A cost benefit analysis showed an annual cost savings of \$100K and a life cycle cost savings of \$1.2 million at one Air Logistics Center from the elimination/minimization of chemical stripping purchases and associated waste streams. The use of laser paint stripping systems is applicable to NASA and DoD depainting activities on small/confined spaces, irregular surfaces, and hard-to-reach areas on a variety of components, and GSE.

NASA was involved in the development of the project's [Joint Test Protocol \(JTP\)](http://www.jgpp.com/projects/plcrs/documents/plcrsjtp.pdf) (<http://www.jgpp.com/projects/plcrs/documents/plcrsjtp.pdf>) and aided in the selection of alternatives. NASA substrates and testing requirements were also incorporated into the test program. Lasers were tested on a variety of GSE from several NASA Centers and Boeing for use on several types of Orbiter hardware including tile cavity applications as well as aluminum honeycomb, inconel, and other sensitive substrates.

Because of the promising results from this JG-PP demonstration, NASA launched a more in-depth, NASA-specific project to validate the portable laser coating removal technology. In 2006 a major demonstration of a portable laser was performed at Kennedy Space Center. Over 100 components and test panels were submitted for testing during the demonstration. Future implementation may include Non-Destructive Evaluation testing for weld-line inspections and small-area applications where blast media is not permitted such as Delta IV launch structures. Future work is being aimed at developing a large scale coating removal system which will further reduce waste streams.